

## Postdoctoral Position. The Geometry of Temporal Cognitive Maps.

[Cognition & Brain Dynamics](#) • [CEA](#), DRF/Joliot, [NeuroSpin](#) • [INSERM UNICOG](#) • Univ. Paris-Saclay

### Postdoctoral position to study the neural basis of temporal cognition in humans.

The Cognition & Brain Dynamics lab studies temporal cognition, how the brain represents time, measures and stores durations, builds temporal expectations, orient attention in past or future, and more generally, structure events in temporal cognitive maps. Applications are invited for a full-time postdoctoral scholar funded by the ERC Synergy Grant “Chronology: the geometry of temporal cognitive maps” whose main goal is to assess the geometry of temporal cognitive maps.

The candidate should have a Ph.D. with a record of accomplishment in cognitive neuroscience research, as evidenced by first author international peer-reviewed publications. Expertise in human experimentation, neuroimaging methods (MEG, EEG, and/or fMRI) and machine learning is highly desirable. [Cognition & Brain Dynamics](#) offers an energetic, collaborative, and rigorous research environment with a strong commitment to training and career development. The successful candidate will benefit from being part of a large and vibrant [neuroscience community](#) that fosters excellence in research.

### Requirements:

- hold a Ph.D. in cognitive neurosciences, neurosciences, psychology or related fields
- solid record of internationally peer-reviewed published work
- strong to expert interest in temporal cognition, cognitive maps, memory
- mastery of English language (fluent oral and written communication)

### Hard skills:

- neuroscience, cognitive neuroscience, and/or computational neuroscience
- human neuroimaging (MEG, EEG, and/or fMRI)
- programming (python preferred)
- analysis of multivariate neuroimaging data, dimensionality reduction techniques, machine-learning, decoding

### Soft skills:

- scientific integrity
- autonomy in problem-solving and learning new skills
- organized and pro-active
- collegial, good lab citizen

### Application package

- ✓ **CV** (incl. a list of publications)
- ✓ **A reprint of what you consider to be your best work**
- ✓ **A letter of intent with a statement of research interests**
- ✓ **Three letters of recommendation** (or contacts from which those could be obtained)

Salary will be commensurate with the level of experience. Interested candidates should send their application package and informal inquiries with the header “SyG Postdoc” to [Virginie.van-Wassenhove@cea.fr](mailto:Virginie.van-Wassenhove@cea.fr) and [Virginie.van.Wassenhove@gmail.com](mailto:Virginie.van.Wassenhove@gmail.com). Applications will be considered until the position is filled.

**General description of postdoctoral position:** The selected candidate will work directly with Virginie van Wassenhove and will contribute to the development, consolidation, and validation of experimental protocols dedicated to the understanding on how the human brain represents time.

The work will take place at [NeuroSpin](#). The selected postdoctoral fellow will actively coordinate with members of the SyG team as frequently and as necessary as needed for the advancement of the project. The selected candidate will be responsible for the development and transfer of knowledge within the project. S/he will setup neuroimaging experiments (MEG, EEG, fMRI) and help supervise Master and PhD students. The successful candidate will benefit from, and contribute to, the interdisciplinary collaboration. Involvement in the organizational and managerial aspects are also expected, including the organization of meetings, journal clubs, and the contribution to reporting activities. The scientific contribution to the health of the research group will include contributing to weekly meetings and taking part in informal discussions with members of the team and of the consortium.

### **ERC SyG Chronology (4 co-PIs)**

- [Virginie van Wassenhove](#), Commissariat à l’Energie Atomique et aux Energies Alternatives, NeuroSpin, INSERM, Université Paris-Saclay, Gif-sur-Yvette, France
- Brice Bathellier, Centre National de la Recherche Scientifique, Institut Pasteur, Institut de l’Audition, Paris, France
- Mehrdad Jazayeri, Massachusetts Institute of Technology, Boston, USA
- Srdjan Ostojic, Ecole Normale Supérieure, Paris, France

Experiencing the world and inferring its causal structure rely on the flexible temporal organization of information in the brain, enabling future planning in thoughts and actions. Understanding how the brain maps events in time is essential, yet surprisingly little is known about the neural mechanisms by which the brain represents time and uses it for computations. Based on the observation that complex neural activity accompanies the mental evaluation of time across species, our project aims at testing the hypothesis that the collective dynamics of brain circuits involved in memory generate and organize representation of temporality. To identify the key structures of time representations in the brain, we will record neural activity at different neuroanatomical scales (from neuron to whole-brain) in three species (rodents, non-human primates, and humans) while individuals are behaving in timing tasks of varying cognitive complexity. A geometrical analysis of neural activity will determine the existence of temporal cognitive maps that provide individuals with a mental chronology of experienced events. We will test if the navigation of temporal cognitive maps is involved in tasks where individuals mentally travel in time. Exploiting state-of-the-art artificial intelligence methods to build interpretable recurrent neural network models, we will identify generic processes supporting the emergence of time representations by comparing signatures of theoretical mechanisms with brain activity. Targeted causal manipulation at the single cell resolution will help select precise mechanisms among model-based hypotheses, including the role of local and long-range neuronal connectivity in the establishment of circuit dynamics that develop across time scales. Our synergistic cross-disciplinary team will establish an innovative, biologically-grounded, overarching framework for the representation of time in the brain, its dependence on context, and its relation to memory.